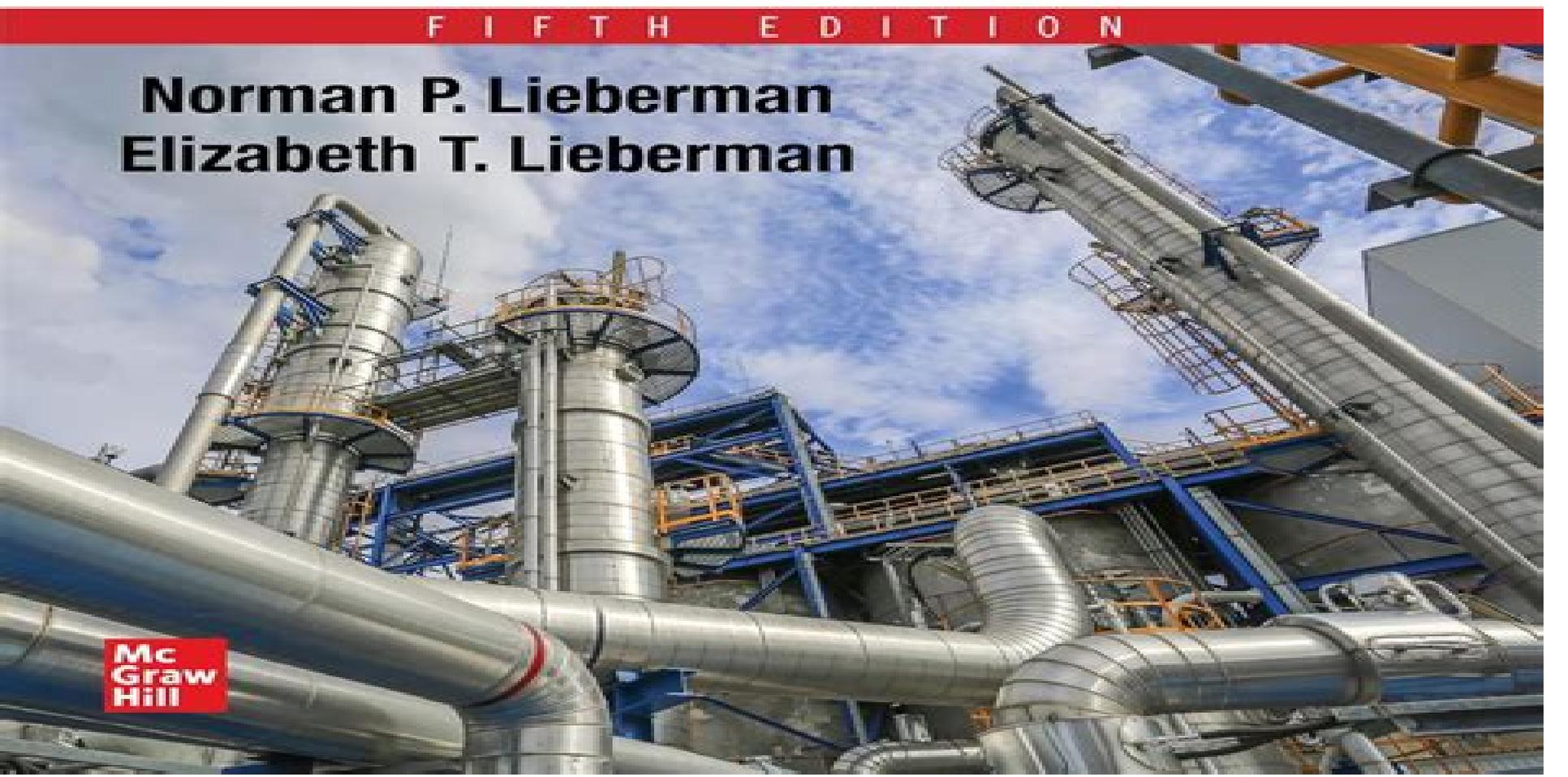


# A WORKING GUIDE TO PROCESS EQUIPMENT

F I F T H E D I T I O N

**Norman P. Lieberman**  
**Elizabeth T. Lieberman**

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# A Working Guide To Process Equipment

**Chao Zhang**



## **A Working Guide To Process Equipment:**

**Working Guide to Process Equipment, Third Edition** Norman Lieberman, Elizabeth Lieberman, 2008-05-18 Diagnose and Troubleshoot Problems in Chemical Process Equipment with This Updated Classic Chemical engineers and plant operators can rely on the Third Edition of A Working Guide to Process Equipment for the latest diagnostic tips practical examples and detailed illustrations for pinpointing trouble and correcting problems in chemical process equipment This updated classic contains new chapters on Control Valves Cooling Towers Waste Heat Boilers Catalytic Effects Fundamental Concepts of Process Equipment and Process Safety Filled with worked out calculations the book examines everything from trays reboilers instruments air coolers and steam turbines to fired heaters refrigeration systems centrifugal pumps separators and compressors The authors simplify complex issues and explain the technical issues needed to solve all kinds of equipment problems Comprehensive and clear the Third Edition of A Working Guide to Process Equipment features Guidance on diagnosing and troubleshooting process equipment problems Explanations of how theory applies to real world equipment operations Many useful tips examples illustrations and worked out calculations New to this edition Control Valves Cooling Towers Waste Heat Boilers Catalytic Effects and Process Safety Inside this Renowned Guide to Solving Process Equipment Problems Trays Tower Pressure Distillation Towers Reboilers Instruments Packed Towers Steam and Condensate Systems Bubble Point and Dew Point Steam Strippers Draw Off Nozzle Hydraulics Pumparounds and Tower Heat Flows Condensers and Tower Pressure Control Air Coolers Deaerators and Steam Systems Vacuum Systems Steam Turbines Surface Condensers Shell and Tube Heat Exchangers Fire Heaters Refrigeration Systems Centrifugal Pumps Separators Compressors Safety Corrosion Fluid Flow Computer Modeling and Control Field Troubleshooting Process Problems

**Working Guide to Process Equipment** Norman P. Lieberman, Elizabeth T. Lieberman, 2003 Working Guide to Process Equipment 2nd Ed carefully and clearly explains all the basic technical issues that you need to know to trouble shoot most process equipment problems This guide contains a wealth of useful diagnostic tips worked out calculations practical examples and informative illustrations to help you quickly pinpoint trouble and repair typical malfunctions in Trayed and packed distillation towers Natural and forced reboilers Partial and total condensers Steam systems and deaerators Vacuum systems Fired heaters Shell and tube heat exchangers Centrifugal compressors Gas turbines and reciprocating engines Centrifugal pumps and motor drivers In no time at all this essential problem solving manual will become your most trusted on the job tool for dealing effectively with costly equipment malfunctions

**A Working Guide to Process Equipment, Fifth Edition** Norman P. Lieberman, 2021-03-08 The latest methods for troubleshooting and maintaining process equipment While directed particularly at chemical and petroleum refining process equipment the new edition of A Working Guide to Process Equipment revised and fully up dated throughout remains applicable to a broad range of technicians and industries and explains how to diagnose troubleshoot and correct problems without complex equations and computer simulations without ever losing sight

of the importance of direct field measurements and observations. Nine new chapters cover: Determining the Causes of Wet Steam Distillation, Process Engineering Design Errors, Technical Adventures from the Past, Setting Pressure Relief Valves, Applying Process Engineering Technology to Natural Gas Production, Reduction of Flare Losses, Suppressing CO<sub>2</sub> Emissions and Energy Conservation, A Final Word, The Earth's Oxygen Content, Evaluating Distillation Tray Capacity. Filled with examples and illustrations, the new edition of this practical resource continues to demonstrate how theory applies to solving real world plant operation problems. Selected hand calculation methods are also provided. You'll gain insights from decades of work from the two authors solving process problems and carrying out test runs in the field, revamping equipment for better efficiency, and the questions and answers explored in the Lieberman's Process Equipment Troubleshooting Seminars conducted. *A Working Guide to Process Equipment, Fourth Edition* Elizabeth T. Lieberman, Norman P.

Lieberman, 2014-05-28. Publisher's Note: Products purchased from Third Party sellers are not guaranteed by the publisher for quality, authenticity, or access to any online entitlements included with the product. The latest methods for troubleshooting and maintaining process equipment. Applicable to a broad range of technicians and industries and fully updated throughout. *A Working Guide to Process Equipment, Fourth Edition* explains how to diagnose, troubleshoot, and correct problems with chemical and petroleum refining process equipment. Nine new chapters cover: Tray design details, Shell and tube heat exchanger design details, Relief valve system design, Vapor lock and exchanger flooding in steam systems, Steam generation operating and design details, Wastewater strippers, Thermodynamics how it applies to process equipment, Centrifugal pumps, reducing seal and bearing failures, Hand calculations for distillation towers, Vapor liquid equilibrium, absorption and stripping calculations. Filled with examples and illustrations, this practical resource demonstrates how theory applies to solving real world plant operation problems. Selected hand calculation methods are also provided. Comprehensive coverage includes: Distillation Tower Trays, Tower Pressure Control, Distillation Towers, Reboilers, Tower Internals, Instruments, Packed Towers, Steam and Condensate Systems, Bubble Point and Dew Point, Steam Strippers, Draw Off Nozzle Hydraulics, Pumparounds and Tower Heat Flows, Condensers and Tower Pressure Control, Air Coolers, Deaerators and Steam Systems, Steam Generation, Wastewater Strippers, Vacuum Systems, Steam Turbines, Surface Condensers, Shell and Tube Heat Exchangers, Fired Heaters, Refrigeration Systems, Cooling Water Systems, Catalytic Effects, Centrifugal Pumps, Control Valves, Separators, Centrifugal Compressors, and Surge, Reciprocating Compressors, Corrosion, Fluid Flow in Pipes, Super Fractionation, Stage, Computer Control, Field Troubleshooting. *A Working Guide to Process Equipment* Meenakshi Awasthi, 2015-03. This book includes the latest diagnostic tips, practical examples, and detailed illustrations for pinpointing trouble and correcting problems in chemical process equipment. This updated classic contains new chapters on: Control Valves, Cooling Towers, Waste Heat Boilers, Catalytic Effects, Fundamental Concepts of Process Equipment, and Process Safety. Filled with worked out calculations, the book examines everything from trays, reboilers, instruments, air coolers, and steam turbines to fired heaters, refrigeration

systems centrifugal pumps separators and compressors      **A Working Guide to Process Equipment, Fourth Edition**  
Norman P. Lieberman, Elizabeth T. Lieberman, 2014-03-14 The latest methods for troubleshooting and maintaining process equipment Applicable to a broad range of technicians and industries and fully updated throughout A Working Guide to Process Equipment Fourth Edition explains how to diagnose troubleshoot and correct problems with chemical and petroleum refining process equipment Nine new chapters cover Tray design details Shell and tube heat exchanger design details Relief valve system design Vapor lock and exchanger flooding in steam systems Steam generation operating and design details Wastewater strippers Thermodynamics how it applies to process equipment Centrifugal pumps reducing seal and bearing failures Hand calculations for distillation towers Vapor liquid equilibrium absorption and stripping calculations Filled with examples and illustrations this practical resource demonstrates how theory applies to solving real world plant operation problems Selected hand calculation methods are also provided Comprehensive coverage includes Distillation Tower Trays Tower Pressure Control Distillation Towers Reboilers Tower Internals Instruments Packed Towers Steam and Condensate Systems Bubble Point and Dew Point Steam Strippers Draw Off Nozzle Hydraulics Pumparounds and Tower Heat Flows Condensers and Tower Pressure Control Air Coolers Deaerators and Steam Systems Steam Generation Wastewater Strippers Vacuum Systems Steam Turbines Surface Condensers Shell and Tube Heat Exchangers Fired Heaters Refrigeration Systems Cooling Water Systems Catalytic Effects Centrifugal Pumps Control Valves Separators Centrifugal Compressors and Surge Reciprocating Compressors Corrosion Fluid Flow in Pipes Super Fractionation Stage Computer Control Field Troubleshooting      **Working Guide to Process Equipment** Norman P. Lieberman, Elizabeth T. Lieberman, 2003 Working Guide to Process Equipment 2nd Ed carefully and clearly explains all the basic technical issues that you need to know to trouble shoot most process equipment problems This guide contains a wealth of useful diagnostic tips worked out calculations practical examples and informative illustrations to help you quickly pinpoint trouble and repair typical malfunctions in Trayed and packed distillation towers Natural and forced reboilers Partial and total condensers Steam systems and deaerators Vacuum systems Fired heaters Shell and tube heat exchangers Centrifugal compressors Gas turbines and reciprocating engines Centrifugal pumps and motor drivers In no time at all this essential problem solving manual will become your most trusted on the job tool for dealing effectively with costly equipment malfunctions      *Working Guide to Process Equipment, Third Edition* Norman P. Lieberman, 2008 Filled with worked out calculations chemical engineers and plant operators can rely on this updated classic for diagnostic tips practical examples and detailed illustrations for pinpointing trouble and correcting problems in chemical process equipment      *Troubleshooting Vacuum Systems* Norman P. Lieberman, 2012-12-03 Vacuum systems are in wide spread use in the petrochemical plants petroleum refineries and power generation plants The existing texts on this subject are theoretical in nature and only deal with how the equipment functions when in good mechanical conditions from the viewpoint of the equipment vendor Also the existing texts

fail to consider the interaction of the vacuum system with the process equipment it serves and the variability of the motive steam conditions change in cooling water temperature condenser fouling and erosion of the ejectors Here are some of the many questions answered in this groundbreaking volume Why does my first stage jet make a surging sound during hot weather Why does the vacuum suddenly break I ve seen moisture condensing on the jet s body What s causing that Why do I have to steam out the drain legs from our condensers Superheated steam is making our vacuum worse Is this normal How can I locate and measure air leaks Reducing the steam pressure to my jets improves vacuum But why I can t pull the pre condenser bundle The shell side is fouling What should I do We re not getting our normal horsepower from our steam turbine Could this be a jet problem Raising the seal drum level improves vacuum Is there an explanation for this Our turbine exhaust steam pressure to our surface condenser has doubled in the last two years What should we do Restricting cooling water flow from our elevated condensers improves vacuum Is this possible What s a converging diverging ejector all about What s the difference between a barometric condenser and a surface condenser Which is better

Petroleum Refining Design and Applications Handbook, Volume 1 A. Kayode Coker,2018-08-09 There is a renaissance that is occurring in chemical and process engineering and it is crucial for today s scientists engineers technicians and operators to stay current With so many changes over the last few decades in equipment and processes petroleum refining is almost a living document constantly needing updating With no new refineries being built companies are spending their capital re tooling and adding on to existing plants Refineries are like small cities today as they grow bigger and bigger and more and more complex A huge percentage of a refinery can be changed literally from year to year to account for the type of crude being refined or to integrate new equipment or processes This book is the most up to date and comprehensive coverage of the most significant and recent changes to petroleum refining presenting the state of the art to the engineer scientist or student Useful as a textbook this is also an excellent handy go to reference for the veteran engineer a volume no chemical or process engineering library should be without Written by one of the world s foremost authorities this book sets the standard for the industry and is an integral part of the petroleum refining renaissance It is truly a must have for any practicing engineer or student in this area

**Troubleshooting Process Plant Control** Norman P. Lieberman,2024-09-11 A practical and engaging guide to running process controls in petrochemical plants and refineries Process control is an area of study dealing with controlling variables that emerge in process plants such as chemical plants wastewater purification plants or refineries Existing guides to process control are numerous but they tend to be associated with control engineering which is more mathematical and theoretical There is an urgent need for a more straightforward and concrete guide for practical use in petrochemical plants and refineries Troubleshooting Process Plant Control meets this need with a work dedicated to real life solutions and problem solving Rooted in real world examples and the career experience of the author it largely avoids complex mathematics in favor of practical well established process engineering principles Now fully updated to reflect the latest best

practices and developments in the field it is indispensable for process controllers in active plants of all kinds Readers of the third edition will also find New chapters on alarm disabling spectrometer use and reducing CO<sub>2</sub> emissions Additional novel examples throughout Guidelines for using spectrometers to directly control reflux rates and steam flow to reboilers Troubleshooting Process Plant Control is ideal for practicing engineers and other technical professionals working in process facilities as well as advanced students taking professional training courses in these fields

**Process Equipment Malfunctions: Techniques to Identify and Correct Plant Problems** Norman Lieberman, 2011-07-12 A PRACTICAL GUIDE TO TROUBLESHOOTING PROCESS EQUIPMENT MALFUNCTIONS Process Equipment Malfunctions offers proven techniques for finding and fixing process plant problems and contains details on failure identification Diagnostic tips examples and illustrations help to pinpoint and correct faults in chemical process and petroleum refining equipment Complex math has been omitted An essential resource for plant operators and process engineers this book is based on the author's long career in field troubleshooting process problems COVERAGE INCLUDES Distillation tray malfunctions Packed tower problems Distillation tower pressure and composition control Fractionator product stripping Pumparounds Reboiled and steam side strippers Inspecting tower internals Process reboilers thermosyphon circulation Heat exchangers Condenser limitations Air coolers Cooling water systems Steam condensate collection systems Steam quality problems Level control problems Process plant corrosion and fouling Vapor liquid separation vessels Hydrocarbon water separation and desalters Fired heaters draft and excess O<sub>2</sub> Disabling safety systems Vacuum systems and steam jets Vacuum surface condensers Centrifugal pump limitations Steam turbine drivers Centrifugal compressors Reciprocating compressors

**Separation Process Technology** Jimmy L. Humphrey, George E. Keller, 1997 Separation Process Technology is a comprehensive guide to the fundamentals selection applications and installation methods of innovative separation technologies

**A Working Guide to Shell-and-tube Heat Exchangers** Stanley Yokell, 1990

**Distillation Troubleshooting** Henry Z. Kister, 2006-04-07 THE FIRST BOOK OF ITS KIND ON DISTILLATION TECHNOLOGY The last half century of research on distillation has tremendously improved our understanding and design of industrial distillation equipment and systems High speed computers have taken over the design control and operation of towers Invention and innovation in tower internals have greatly enhanced tower capacity and efficiency With all these advances one would expect the failure rate in distillation towers to be on the decline In fact the opposite is the case the tower failure rate is on the rise and accelerating Distillation Troubleshooting collects invaluable hands on experiences acquired in dealing with distillation and absorption malfunctions making them readily accessible for those engaged in solving today's problems and avoiding tomorrow's The first book of its kind on the distillation industry the practical lessons it offers are a must for those seeking the elusive path to trouble free distillation Distillation Troubleshooting covers over 1 200 case histories of problems diagnoses solutions and key lessons Coverage includes Successful and unsuccessful struggles with plugging fouling and coking Histories and prevention of tray

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**The ASQ Pocket Guide to Failure Mode and Effect Analysis (FMEA)** D.H. Stamatis,2014-08-21 The recognition that all well managed companies are interested in preventing or at least minimizing risk in their operations is the concept of risk management analysis This pocket guide explores the process of evaluation of risk by utilizing one of the core methodologies available the failure mode and effect analysis FMEA The intent in this Pocket FMEA is to provide the reader with a booklet that makes the FMEA concept easy to understand and provide some guidelines as to why FMEA is used in so many industries with positive results The booklet is not a complete reference on FMEA but rather a summary guide for anyone who wants some fast information regarding failures and how to deal with them It covers risk reliability and FMEA prerequisites of FMEA what an FMEA is robustness the FMEA form and rankings types of FMEA and much more Cumulative Book Index ,1998 A world list of books in the English language

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## **Table of Contents A Working Guide To Process Equipment**

1. Understanding the eBook A Working Guide To Process Equipment
  - The Rise of Digital Reading A Working Guide To Process Equipment
  - Advantages of eBooks Over Traditional Books
2. Identifying A Working Guide To Process Equipment
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an A Working Guide To Process Equipment
  - User-Friendly Interface
4. Exploring eBook Recommendations from A Working Guide To Process Equipment
  - Personalized Recommendations
  - A Working Guide To Process Equipment User Reviews and Ratings
  - A Working Guide To Process Equipment and Bestseller Lists
5. Accessing A Working Guide To Process Equipment Free and Paid eBooks
  - A Working Guide To Process Equipment Public Domain eBooks
  - A Working Guide To Process Equipment eBook Subscription Services
  - A Working Guide To Process Equipment Budget-Friendly Options
6. Navigating A Working Guide To Process Equipment eBook Formats
  - ePub, PDF, MOBI, and More
  - A Working Guide To Process Equipment Compatibility with Devices
  - A Working Guide To Process Equipment Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of A Working Guide To Process Equipment
  - Highlighting and Note-Taking A Working Guide To Process Equipment
  - Interactive Elements A Working Guide To Process Equipment

8. Staying Engaged with A Working Guide To Process Equipment
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers A Working Guide To Process Equipment
9. Balancing eBooks and Physical Books A Working Guide To Process Equipment
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection A Working Guide To Process Equipment
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine A Working Guide To Process Equipment
  - Setting Reading Goals A Working Guide To Process Equipment
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of A Working Guide To Process Equipment
  - Fact-Checking eBook Content of A Working Guide To Process Equipment
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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